SECTION—B

There are **four** questions from Question No. 2 to Question No. 5. Answer *either (a) or (b)* from each question.

2. *(a)* *(i)* Discuss the energy level diagram of *n*-type and *p*-type semiconductors.

(ii) What are barrier potential and barrier width for step junction? Explain how they vary in forward and reverse bias of diode.

(iii) For *p-n* junction, derive expression for barrier potential. 3+(2+3)+4=12

(OR)

(b) *(i)* What is LED? How is it work? Explain briefly.

(ii) Discuss how a Zener diode can be used to regulate the voltage. Draw a simple circuit diagram for operation.

(iii) Write the difference between ordinary diode and Zener diode.

(iv) A power supply is delivering 100 W to a load of 10 kΩ. Find the AC voltage present across the load if ripple factor is 0·1%. (1+3)+3+2+3=12

2. (a) (i) What is mobility? Establish a relation between conductivity and mobility in an extrinsic semiconductor containing both electrons and holes.

(ii) Distinguish between Avalanche breakdown and Zener breakdown.

(iii) Explain fully how a zener diode is used as a voltage regulator with variation in load resistance.

(iv) The reverse saturation current in a Ge diode is 10μA at room temperature. Find the static and dynamic resistances of the diode at a forward voltage of 0.2V.

(1+3)+2+4+2

b) (i) Draw a neat circuit diagram of a bridge rectifier and explain the working.

(ii) What is ripple factor? Calculate value of ripple factor in case of

(A) half wave rectifier

(B) full wave rectifier.

(iii) What is a solar cell? Sketch the cross-section of a typical solar cell. Explain with a circuit diagram how an array of solar cells can be used as a battery charger. 4+4+4

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2. *(a)* *(i)* Explain how barrier formed in between p and n region of p-n junction diode.

(ii) Discuss with proper diagram or sketch the current flow mechanism in forward and reverse biased p-n diode.

(iii) With neat circuit diagram, explain how Zener diode can be used as voltage regulator.

(iv) Calculate the AC voltage across a load of 1 kΩ, if ripple factor is 0·5%. Given the power applied is 200 W. 3+3+3+3=12

(OR)

(b) *(i)* With a neat circuit diagram, explain the working of a bridge full-wave rectifier.

(ii) Discuss the construction and working of a solar cell.

(iii) Draw a circuit diagram of p-n junction diode in forward bias and explain the forward characteristics graph. Also show how can we measure AC and DC resistance from the graph.

4+3+(1+2+2)=12